Appendix 1B

Site Characteristics Used to Develop Forest Service Water Resource Protection Measures (WRPMs)

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Mining sites were visited by the Forest Service district hydrologist or the fisheries biologist. The proposed mining sites varied by topography, ground cover, presence of stream tailings, micro-topography, presence of beavers, and presence of adits. Based on the site characteristics, Water Resource Protection Measures (WRPMs) were developed (Appendix 1A) to eliminate the potential for a discharge of pollutant into any channel and ensure compliance with Clean Water Act (CWA) and PACFISH MM-2. While variability existed between sites, they fell into the general categories listed below.

1. Operations on valley floor
    a. No placer tailings line the channel bank
    b. Placer tailings line the channel bank
2. Operation on a hillslope
    a. No placer tailings line the channel bank
    b. Placer tailings line the channel bank
3. Beaver dams
    a. Currently present
    b. Likely to be present at some time in the near future
4. Adit present
    a. Not discharging water
    b. Discharging water and within 300 feet of perennial stream or natural wetland BUT not discharging directly into either
        i. Operation plans to use adit water BUT not work the lode.
        ii. Operation plans to use the adit water AND work the lode.
        iii. Operation will not use the adit water OR work the lode.
    c. Discharging water and within 300 feet of perennial stream or natural wetland AND discharging directly into one or the other
        i. Operation plans to use adit water BUT not work the lode.

ii. Operation plans to use the adit water AND work the lode.

iii. Operation will not use the adit water OR work the lode.

d. Discharging water and greater than 300 feet from perennial stream or natural wetland

i. Operation plans to use adit water BUT not work the lode.

ii. Operation plans to use the adit water AND work the lode.

iii. Operation will not use the adit water OR work the lode.

5. Miscellaneous Site Characteristics

Discussion of Site Characteristics for each Category

1. Operation on valley floor: Starting point of buffer measurement clarified and buffer widths adjustments made from Alternative 2

a. *No placer tailings line the channel bank*

Most proposed Plans of Operation identified buffers around streams, wetlands, and springs. However, the location of where the buffer measurement started was often ambiguous because it was tied the stream. The low-flow stream varies in width from year to year and within a given season, and the wetted edge is therefore not a fixed location. Identifying the high spring flow edge requires evaluating a number of field elements (i.e. vegetation type, erosion lines, bar morphology) to determine the hydrologic bankfull or yearly high flow edge to a stream *(Harrelson et al. 1994)*. Because many of these channels have widened and incised, there are often multiple points that one could choose from when measuring a distance “from the creek”. For example, in **Figures 1B-2 and 1B-3**, Points A, B, and C all meet that definition but at progressively higher stream flows (Point A being the low flow or summer flow edge and Point C being the very high flood event edge).

The ambiguity raised questions about where the miner planned to start their buffer measurement: Was the plan referring to the 1) the low-flow stream edge during operation which would vary from year to year, 2) from the stream edge as defined by the high spring runoff flow and if so what where the indicators used to determine that location or 3) from the top of the stream bank or edge of terrace? Was the intention of the miners to stay out of the active floodplain or off unstable banks? This ambiguity is a problem because the starting location of the buffer measurement determines the degree to which a buffer eliminates the potential for a discharge of sediment into navigable waters as defined by the CWA.

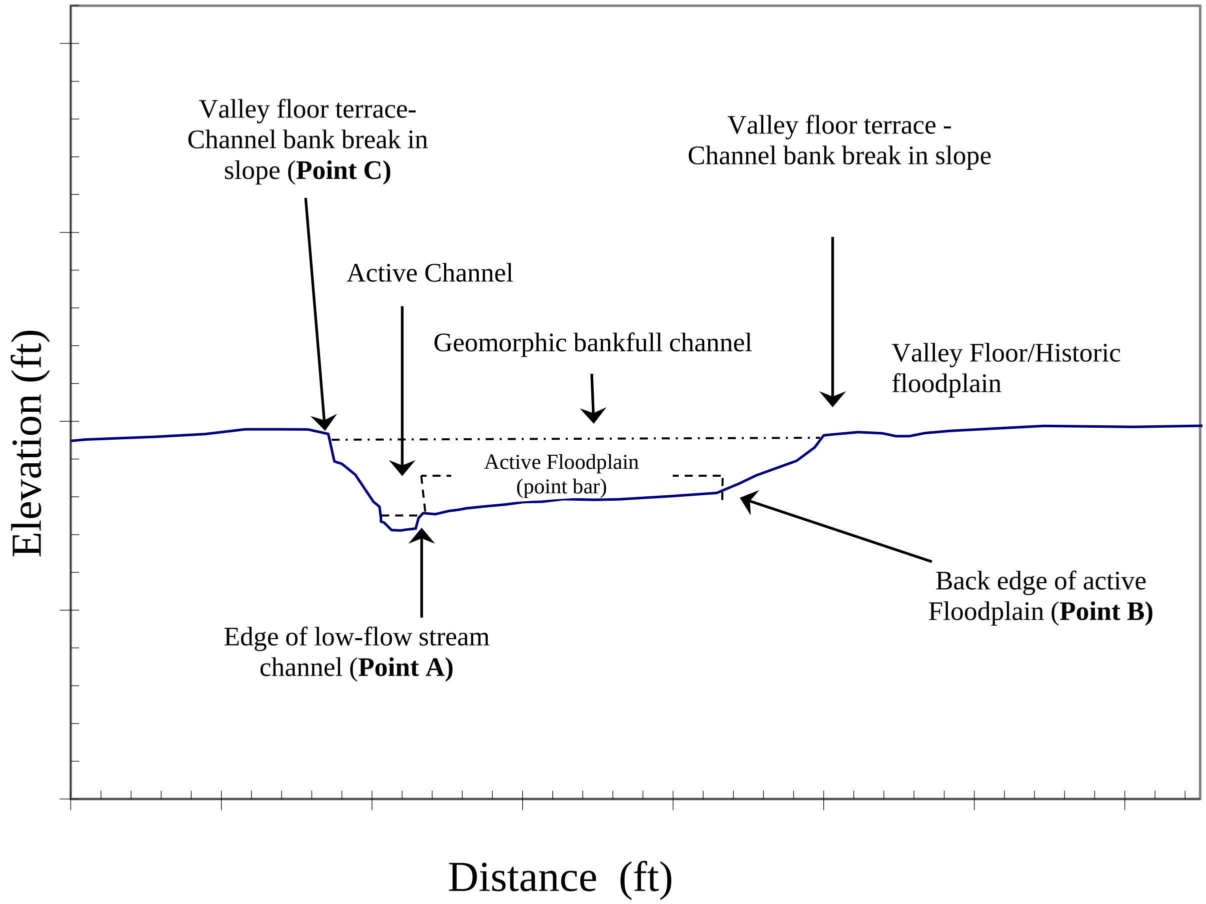

Figure 1B-1. Shows the location of the Valley floor terrace (historic floodplain) –Channel break-in-slope geomorphic feature. Note that this edge is NOT the streambank of the active channel but the streambank of the larger geomorphic channel. The active channel is inset into the geomorphic channel.

Figure 1B-2. Stream showing location of points mentioned in Figure 1B-1. Solid white arrow at the location of the valley floor-channel bank (VFT-CB) break-in-slope feature (**Point C)**. Dashed white arrow is at the point bar which is part of the active floodplain.

In order to eliminate the ambiguity and ensure no potential for a discharge of a pollutant, regardless of stream flow, a geomorphic rather than hydrologic feature was selected as the starting point for the buffer measurement. The geomorphic feature chosen as the starting point was the valley floor terrace-channel bank (VFT-CB) break-in-slope when present (**Figures 1B-1 and 1B- 2**). This geomorphic feature is clearly visible in the field and does not vary from year to year or within a season, unless an erosional event has occurred. The valley floor is the historic floodplain which has been isolated from the stream as a result of channel widening and incision due to historic land use. The selection of this geomorphic feature as the starting point puts proposed mining activities on the valley floor and outside the active floodplain, stream banks, and valley floor terrace banks. Current vegetation on the valley floor is drought tolerant, indicating that this geomorphic surface is rarely flooded.

Figure 1B-3 shows how the buffer zone location, and its ability to prevent a discharge of pollutant, varies depending on how the “creek edge” is defined and the topography. In Scenario 1, the operation would be in the stream bank that borders the active floodplain. In Scenario 2, the operation would be on the valley floor terrace, but close to the stream cut bank that borders the active floodplain. Disturbance of the cut bank in Scenarios 1 and 2 would result in sediment moving into the active floodplain which would then be delivered to the stream the following spring. In Scenario 3, the operation would be clearly on the valley floor terrace with 25 feet of a no-activity zone separating the activity from the stream cut bank. In Scenario 4, the operation ends up on a steep hillslope.

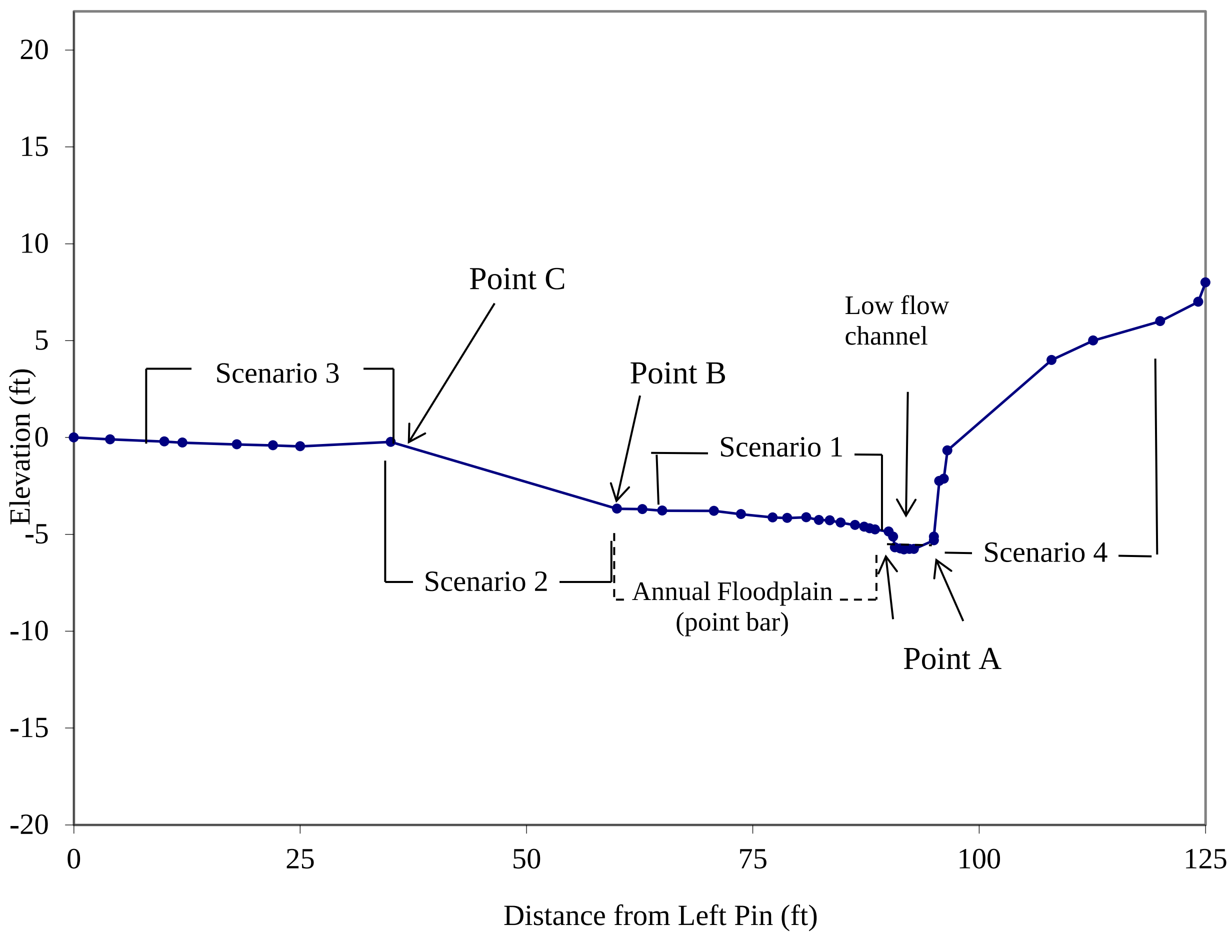

Figure 1B-3. Example of how the selection of a different starting point results in a different location for the operation. Any of these starting points would meet the "from a creek" reference. In this example, buffer distances are 25 feet in all scenarios.

Plan-specific stream buffers for mining-related activities (as specified in Appendix 1A of the EIS) are to be undisturbed.

Buffer widths in the Plans submitted by the miners varied from 10 to 25 feet from the stream. The Forest Service district hydrologist examined those plans and after clarifying the buffer starting point and evaluating the topography, and in the absence of any other circumstances (i.e. presence of placer tailings lining the edge of the valley floor, buffer distances were started at 25 feet and increased as slope increased and/or ground cover decreased. The literature review by *Belt et al. (1992)* discussed the effectiveness of buffer strips on sediment movement. Their review identified slope and density of obstructions as the key factors controlling sediment movement through a buffer strip. Valley floors tend to be flat, or may have considerable micro topography due to historic mining. Ground cover percentages were found to vary from 50 to 100 percent depending on the amount of grazing that is occurring in an area. The flat topography and ground cover results in sediment generated by mining activity moving as sheet, rather than channelized, flow which limits the distance sediment can travel. Given the limited ground disturbance at any one time in a given operation, and the other general requirements that address stockpiled top soil and reclamation, the 25-foot buffer was determined to be sufficient to prevent sediment from entering the stream channel.

b. Placer tailings line the channel bank

Many operations state that they will have a 25-foot buffer in place to protect water quality. The starting point of measurement is, however, not clearly stated (See **Figure 1B-3**) and the effectiveness of the proposed buffer varies as a function of that starting point. For example, many proposed mining sites have old placer tailings lining the stream banks. In these cases, a 25-foot buffer may put the mining operation behind the tailings, in other places within the same operation it would but the mining operation in front of the tailings or on top of the tailings (**Figure 1B- 4**). In the two latter cases, the 25-foot buffer would not be sufficient and there would be a potential for a discharge of sediment into the creek. Therefore, the following modification was made.

The buffer location was tied to the location of the placer tailings lining the streambank and operations placed behind the tailings instead of being assigned a fixed distance (i.e. 25 feet). Because the location of the tailings with respect to the valley floor terrace-channel break-in-slope (VFT-CB) feature varied along the stream, the distance between the operation and the stream varied (Figure 1B-4), in some cases being within 10 feet of the break-in-slope feature. However, the tailings effectively trap sediment and, where present, completely prevent delivery of any sediment generated by the mining activity. Where there are breaks in the tailings piles and the potential for sediment reaching the creek, the 25-foot buffer distance from the VFT-CB break-in-slope feature was invoked along with additional protection measures such as installing straw bales or silt fences.

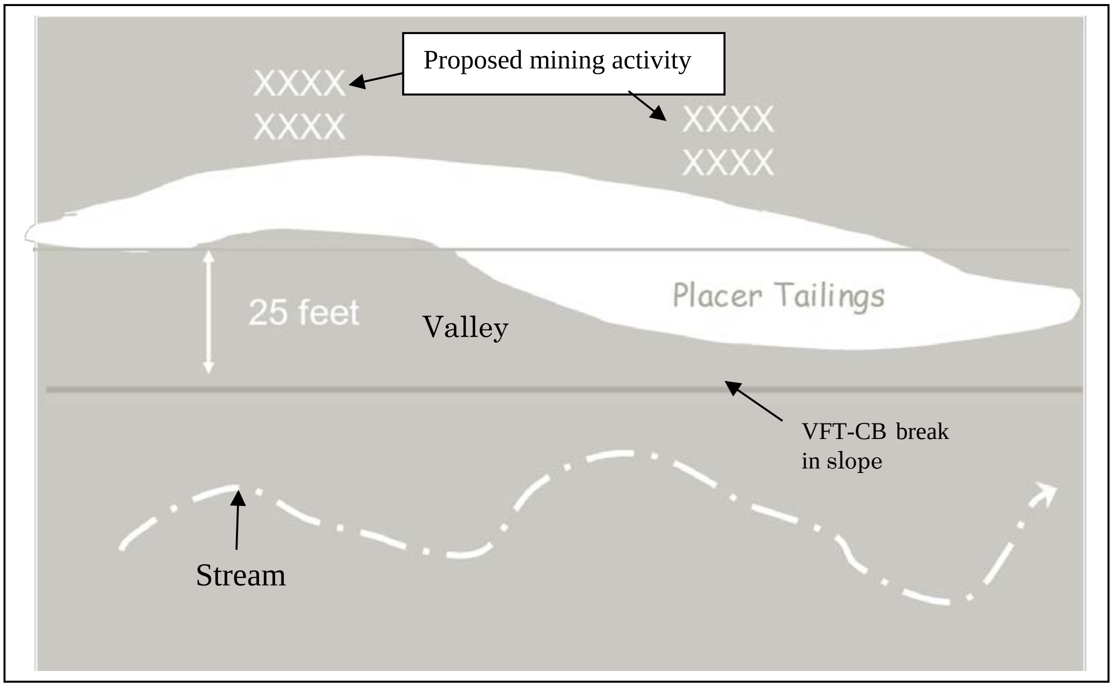

Figure 1B-4. Schematic showing how using the placer tailings piles results in a variable distance from the VFT-CB break-in-slope and the stream. THICK line represents the VFT-CB break-in-slope location.

2. Operations on hillslopes: Starting point of buffer measurement clarified and buffer widths adjustments made from Alternative 2 (reference Figure above)

Operations that occurred on hillslopes fell into three general categories: 1) hillslope feeds into a valley floor terrace where the bench is between 15 and 25 feet wide, 2) hillslope feeds into a valley floor terrace where the valley width (bench) is more than 25-feet wide, or 3) hillslope feeds directly into the stream or where the valley floor terrace is less than 15-feet wide. Where activity was occurring, buffer widths were adjusted as needed to create enough of a buffer strip to capture any sediment generated by activity on the hillslope. The concern with activity on hillslopes is the potential to have channelized flow which is capable of carrying sediment much further than overland flow (*Belt et al. 1992).* In some cases, where ground cover was limited, the hillslopes steep, and/or the valley floor was either absent or narrow, additional requirements were included, such as silt fences or straw bales to prevent sediment delivery to a stream channel.

3. Beaver dams

Beaver dams would not be breached or otherwise disturbed. Instead, miners would evaluate under what conditions a beaver dam could pose a problem to their operation ahead of time and would work with the district hydrologist to design and build pond-elevation control features. These methods allow for beavers and beaver dams to remain and continue to provide water quality and habitat benefits, while preventing the ponds from flooding the mining operations.

4. Adit waters

Several plans, located in the headwaters of various streams, proposed using water from adits for their processing. This water would be piped into processing and settling ponds and allowed to evaporate or seep into the ground and therefore would not directly discharge into surface water or channels that would transfer the water to a perennial stream or wetland.